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Five lichens of the genus *Lecanora* new to China

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Abstract—Five new records from China, *Lecanora argentea*, *L. imshaugii*, *L. nipponica*, *L. novae-hollandiae*, *L. subrugosa* are reported. Photos of their thalli are provided.

Key words—*Lecanoraceae*, Asia, taxonomy

Introduction

The lichen genus *Lecanora (Lecanoraceae)* was originally established by Acharius (1810), distinguished by its crustose thallus with apothecia having thalline tissue containing algal cells. The genus was subsequently restricted by Massalongo (1852) and it was maintained for species with simple, colourless spores of moderate size. Now, *Lecanora* is defined by asci of the *Lecanora*-type, simple, colourless ascospores, and crustose thalli; the apothecial margin usually contains algal cells (Ryan et al. 2004). *Lecanora* sensu stricto is characterized by the presence of oxalate crystals in the amphithecium and the production of atranorin and/or usnic acid in the cortex (LaGreca & Lumbsch 2001).

Worldwide, *Lecanora* (sensu stricto) includes about 300 known species (LaGreca & Lumbsch 2001). In China, this genus (sensu lato) includes 93 species. During our study of *Lecanora* sensu stricto in China, five new records were discovered, namely *Lecanora argentea*, *L. imshaugii*, *L. nipponica*, *L. novae-hollandiae* and *L. subrugosa*.

Material and methods

The specimens studied are housed in SDNU (Lichen Section of Botanical Herbarium, Shandong Normal University) or HMAS-L (Lichen Section, Herbarium of the Institute of Microbiology, Academia Sinica). Thalli were examined and measured under a stereo-microscope (COIC XTL7045B2) and

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apothecial anatomy was observed under a polarizing microscope (OLYMPUS CX41-32). Photos of the thalli were taken with an OLYMPUS SZX12 with DP70. Lichen substances were identified using the standardized thin layer chromatography techniques of Culberson (1972).

The new records

1. *Lecanora argentea* Oxner & Volkova, Nov. Sist. Niz. Rast. 1966: 283 (1966) FIGURE 1A
= *Lecanora fuliginosa* Brodo, Beih. Nova Hedw. 79: 124. 1984.

Thallus whitish gray to yellowish gray, dispersed-verrucose to verruculose, margin definite, prothallus white. Apothecia sessile, 0.6–1.8 mm in diam., discs black brown to black, epruinose, margins concolorous with thallus, even, smooth. Amphithecium: cortex distinct, basally thickened, 20–25 μm laterally, 35–50 μm at base, containing large crystals insoluble in KOH. Epihymenium brown black, not turning green in KOH, without crystals, 10–20 μm tall. Hymenium hyaline, 52.5–70 μm tall, paraphyses slightly thickened. Hypothecium hyaline, 50–100 μm thick. Ascospores simple, hyaline, broadly ellipsoid, 8–15 × 5–8 μm.

CHEMISTRY: atranorin, gangaleoidin.

SUBSTRATE: saxicolous.

COMMENTS — This species is characterized by the saxicolous, crustose thallus, brown-black to black apothecial discs, a clear, egranulose epihymenium, an amphithecium containing large crystals and the presence of gangaleoidin. *Lecanora gangaleoides* is morphologically and chemically similar but differs in having a greenish black epihymenium in KOH. *Lecanora argentea* is also similar to *L. cenisia*, but the latter lacks gangaleoidin and has a coarse granular epihymenium.

L. argentea was described from the former Soviet Union and has been reported from North America and Asia (Brodo 1984, sub *L. fuliginosa*, Ryan et al. 2004). New to China.

SPECIMENS EXAMINED: **CHINA. Shannxi**: Mt. Taibaishan, fangyangsi, alt. 3300m, on rock, 4 Aug. 2005, C.L. Wang & F. Yang, TBW405 (SDNU); **Jilin**: Yanji City, Wangqing Country, Tianqiaoling Town, tulaopoding, alt. 1035m, on rock, 1 Dem. 2007, C. Yuan & L.Y. Sun, 20073428 (SDNU).

2. *Lecanora imshaugii* Brodo, Beih. Nova Hedwigia 79: 137 (1984). FIGURE 1B
= *Lecanora perflexuosa* (Räsänen) H. Miyaw., J. Hattori Bot. Lab. 64 : 320. 1988.

Thallus yellowish grey, thick, verruculose, margin definite, prothallus absent. Apothecia sessile, crowded, (0.3–)0.5–1.5 mm in diam., discs deep reddish brown, epruinose, margins pale yellowish white, usually whiter than thallus,

smooth, prominent, becoming flexuous. Amphithecium: cortex indistinct to absent, 10μm thick when distinguishable, containing small crystals insoluble in KOH. Epihymenium yellowish to reddish brown, containing coarse granules, (7.5–)10–12.5 μm tall. Hymenium hyaline, 50–60 μm tall. Hypothecium hyaline, 60 μm thick. Ascospores simple, hyaline, ellipsoid, 9–16 × 6–7.5 μm.

Chemistry: atranorin, zeorin.

Substrate: corticolous.

Comments — This species is characterized by the corticolous, verruculose thallus, crowded, sessile apothecia, flexuous, dull apothecial margins lacking any cortex, an amphithecium containing small crystals insoluble in KOH, and the presence of zeorin. In lacking a cortex it is only similar to *L. perplexa* which also contains zeorin, but the amphithecium of *L. perplexa* contains large crystals and the thallus is often granulose.

L. imshaugii was described from North America (Brodo 1984) and is also known from Japan (Miyawaki 1994). New to China.

Specimens examined: **CHINA. Gansu**: Diebu country, Laolonggou, alt. 2400m, on bark, 27 Jul. 2005, X.L. Shi & F. Yang, 060711 (SDNU); **Liaoning**: Kuandian country, Baishilizi Nature Reserve, alt. 407m, on bark, 19 Jul. 2000, J.C. Wei & M.R. Huang, 030792 (HMAS-L); Kuandian country, Baishilizi Nature Reserve, Fotanggou, alt. 650m, on bark, 11 Jul. 2000, J.C. Wei & M.R. Huang, 030796 (HMAS-L).

3. *Lecanora nipponica* H. Miyaw., J. Hattori Bot. Lab. 64: 296 (1988) Figure 1c

Thallus yellowish white to yellowish gray, moderately thick, verruculose, margin indistinct, prothallus absent. Apothecia sessile, generally crowded, 0.7–2.2 mm in diam., discs reddish brown to deep brown, epruinose, margins concolorous with thallus, entire to verrucose. Amphithecium: cortex 10–25 μm thick, algae cells abundant, containing large crystals insoluble in KOH. Epihymenium yellowish to reddish brown, containing coarse granules, 10–20 μm tall. Hymenium hyaline, 75–100 μm tall. Hypothecium hyaline, 70–125 μm thick. Ascospores simple, hyaline, ellipsoid, (8–)12.5–15(–20) × 6–12.5 μm.

Chemistry: atranorin.

Substrate: corticolous.

Comments — This species is characterized by the corticolous, verruculose thallus, the prominent apothecial margin, the coarse granular epihymenium, and an amphithecium containing large crystals insoluble in KOH. It is similar to *L. novae-hollandiae* in verruculose thallus, prominent apothecial margin and having coarse granular epihymenium but differs in lacking pannarin

Lecanora nipponica was previously known only from Japan (Miyawaki 1988). New to China.

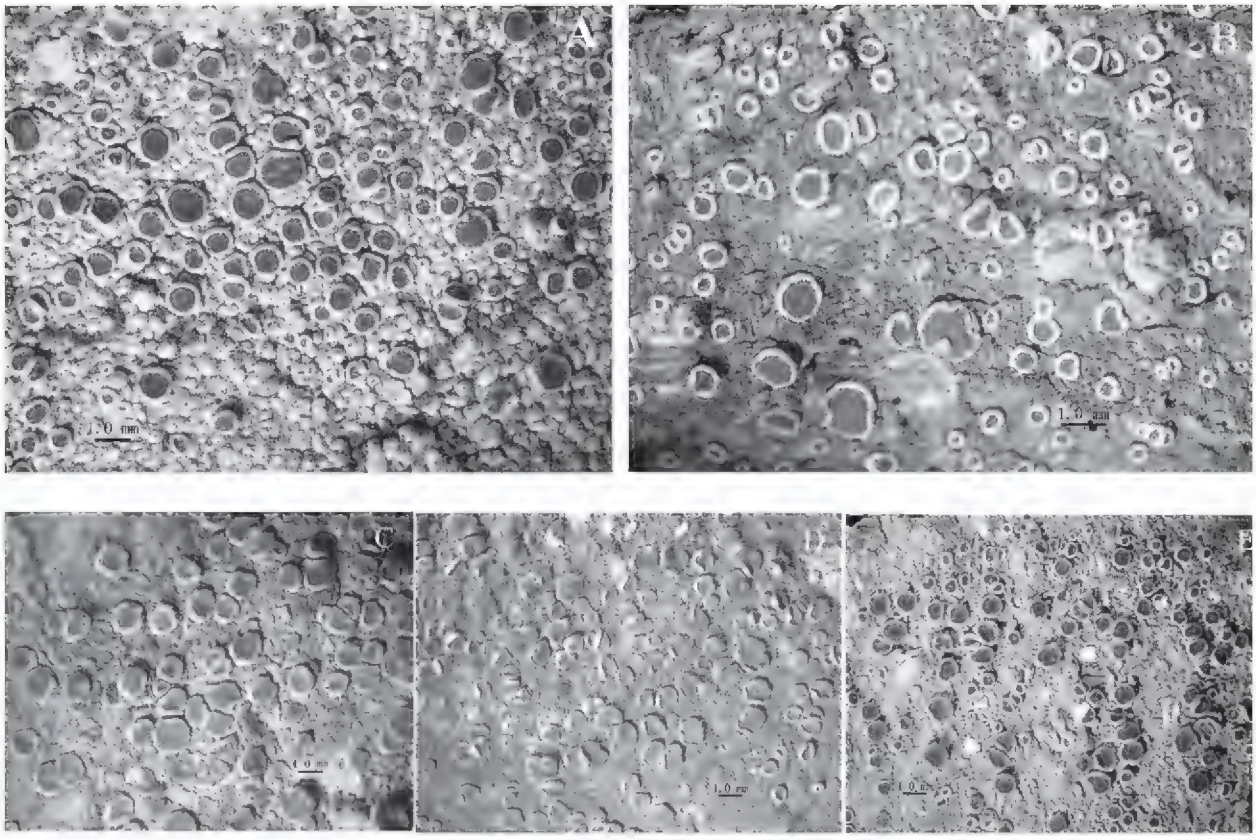

FIGURE 1 *Lecanora* species examined in the present study. Scale bar = 1 mm. A. *Lecanora argentea*, TBW405 C.L. Wang & F. Yang (SDNU); B. *Lecanora imshaugii*, 060711 X.L. Shi & F. Yang (SDNU); C. *Lecanora nipponica*, 033033 X.Y. Wang et al. (HMAS-L); D. *Lecanora novae-hollandiae*, 030787 M.R. Huang (HMAS-L); E. *Lecanora subrugosa*, 060641 Z.F. Jia (SDNU)

SPECIMENS EXAMINED: **CHINA. Yunnan**: Lushui Country, Pianmatingming Lake, alt. 3500m, on bark, 2 Jun. 1981, X.Y. Wang et al., 033033 (HMAS-L); **Shannxi**: Mt. Taibaishan, Shangbaiyun, alt. 1650m, on bark, 1 Aug. 2005, Y.J. Li & W. Fu, L398 (SDNU).

4. *Lecanora novae-hollandiae* Lumbsch,
J. Hattori Bot. Lab. 77: 118 (1994) FIGURE 1D

Thallus yellowish gray, with a rough verrucose surface, margin definite, prothallus gray or absent. Apothecia sessile, 0.5–2.0 mm in diam., discs yellowish to reddish brown, epruinose, margins concolorous with the thallus, entire, smooth or crenulate. Amphithecium: cortex hyaline, uniform, 15–25 μm thick, containing large crystals insoluble in KOH. Epihymenium yellowish to reddish brown, with abundant coarse granules, (7.5–)10–17.5(–22.5) μm tall. Hymenium hyaline, 47.5–62.5 μm tall. Hypothecium hyaline, 25–47.5 μm thick. Ascospores simple, hyaline, broadly ellipsoid, 9–13(–16) × (4.5–)6–9.5μm.

CHEMISTRY: atranorin, pannarin, minor: chloroatranorin, dechloropannarin, methyl-virensate, argopsin.

SUBSTRATE: corticolous.

Comments — This species is characterized by the corticolous, verruculose thallus, pale red-brown apothecial discs, the coarse granular epihymenium, an amphithecium containing large crystals and the presence of pannarin. It is somewhat similar to *L. cinereofusca*, but the latter contains placodiolic acid and its epihymenium pigment dissolves in KOH (Lumbsch & Elix 2004).

L. novae-hollandiae has been reported from Australia and New Zealand (Lumbsch & Elix 2004). New to China.

Specimens examined: **CHINA.Anhui**: Jinzhai country, Tiantangzhai, alt. 800m, on bark, 11 Sep. 2001, M.R. Huang, 030787 (HMAS-L); **Gansu**: Zhouqu country, Huacaopoxigou, alt. 3300m, on wood, 29 July 2006, X.L. Shi & F. Yang, 060939 (SDNU).

5. *Lecanora subrugosa* Nyl., Flora 58: 15 (1875) Figure 1e

Thallus white grey to yellowish grey, verruculose or dispersed verrucose, margin definite, prothallus absent. Apothecia sessile or constricted at base, (0.3–) 0.8–1.7(–2.0) mm in diam., discs reddish brown to dark brown, epruinose, shiny, margins concolorous with the thallus, thick, verruculose. Amphithecium: with large crystals insoluble in KOH, cortex hyaline, inspersed, distinct or decomposed and becoming indistinct, 15–30 μm laterally, up to 40 μm at base. Epihymenium red-brown, lacking granules, 5–15 μm tall. Hymenium hyaline, 50–100 μm tall. Paraphyses slightly thickened. Hypothecium hyaline, 50–75 (–100) μm thick. Ascospores simple, hyaline, broadly ellipsoid, 6.5–12.5 × 4.5–7.5 μm, walls 0.8–1.0 μm thick.

Chemistry: atranorin.

Substrate: corticolous.

Comments — This species is characterized by the corticolous, verruculose thallus, large apothecia with reddish brown discs and coarsely verrucose apothecial margins, egranulose epihymenium and lack of other substances in addition to atranorin. It is similar to *L. rugosella* morphologically, but the latter species has a granulose epihymenium. It is also similar to *L. argentata*, but the latter contains gangaleoidin. Some European collections of *L. subrugosa* contain gangaleoidin (Brodo 1984, Ryan et al. 2004), but specimens from China examined by us do not contain this substance.

Lecanora subrugosa has been reported from North America, Africa, and Europe (Brodo 1984, Ryan et al. 2004). New to China.

Specimens examined: **CHINA.Gansu**: Diebu country: Mogou, alt. 2780m, on bark, 26 Jul. 2006, Z.F. Jia 060641 (SDNU); Wen country: Qiujiaba, alt. 2400m, on bark, 3 Aug. 2006, C.L. Wang & L. Lü, 061843-3 (SDNU); **Shannxi**: Mt. Taibaishan, Shangbaiyun, alt. 1700m, on bark, 1 Aug. 2005, S.X. Guo & X.L. Shi, QL570 (SDNU); Ningshan country, Baiyangling, alt. 1700m, on bark, 28 Jul. 2005, S.X. Guo & X.L. Shi, SH297-1 (SDNU); **Yunnan**: Lijiang country, Mt. Yulongxueshan, Shanzifeng, alt. 3400m, on bark, 5 Aug. 1981, X.Y. Wang et al., 033093 (HMAS-L).

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